# Indiana Department of Environmental Management
# Office of Land Quality
# Supplemental Guidance for Sampling Soil and Waste Samples for Volatile Organic Compounds (VOCs)

**Related Guidance** – Method 5035A, "Closed-System Purge-and-Trap Extraction for Volatile Organics in Soil and Waste Samples," in *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, SW-846, Third Edition, Final Update III; updated method: July 2002. [**Method 5035A**]

**Scope** – This supplemental guidance is intended to provide additional information regarding the collection and preservation of volatile organic compounds (VOCs) within soil and solid waste samples to be analyzed at a stationary, off-site laboratory. Pre-sampling planning is emphasized as essential for meeting sampling objectives. Method 5035A contains critical information on sampling and analytical requirements and thus should be consulted alongside this document when developing site-specific sampling plans.

The techniques described in the Method 5035A represent a significant departure from those traditionally used in the environmental field for sampling of VOCs in solid materials. Traditional sampling methods have been shown to result in losses of VOCs that are significant to certain project objectives. The Method 5035A procedures are designed to minimize losses of VOCs due to volatilization and biodegradation. This supplement will identify instances where it is critical to have the greater accuracy provided by Method 5035A.

**Applicability** – This supplemental guidance applies to all Office of Land Quality programs that require the laboratory analysis of VOCs or Total Petroleum Hydrocarbons (TPH – see discussion below) in soil or solid waste.

**General Guidance** – Method 5035A does *not* provide detailed guidance regarding systematic planning, sampling design, retrieval of sub-surface soil cores, or the actual steps for determining VOCs in the laboratory. These and other aspects of a sampling project should be adjusted as needed to assure losses of sample VOCs are minimized.

Several options for the collection, preservation, and storage of samples for VOC analysis are described in Appendix A of SW-846 Method 5035A. The necessity for representative sampling demands that sample collection and preservation options are selected based on the requirements of the data quality objectives (DQOs) for the project. The selection of a specific Method 5035A sampling technique for a project is not solely based upon availability of sample containers, convenience or simplicity of use, or lowest price.

To minimize loss of VOCs, sub-surface soils are retrieved and sub-sampled as quickly as possible, taking special care to limit exposure and disaggregation of the soil's physical structure. Once a core barrel has been opened, the collection of sub-samples is the first

activity performed (i.e., pre-empting even the logging of sub-surface core sample recovery and other soil characteristics). If a second core is obtained before the first core has been logged, the logging of the first core should be set aside until the second core has been sampled. In some cases, this is a change in the order in which work is done. The use of intermediate storage containers (e.g., core barrel liners, plastic bags, large glass jars) to hold soil for extended periods prior to sub-sampling by Method 5035A defeats the project intent and is to be avoided. The field log or boring log should show the time the sub-surface core is retrieved and the time sub-samples are collected.

If the surface of a soil core has been exposed for more than a minute or two (due to an unforeseen delay, field screening to determine the interval to be sampled, etc.), a fresh surface is created just prior to sub-sampling by Method 5035A. Sampling personnel should be ready to take sub-samples immediately after the sub-surface core is retrieved. Drill rig personnel should adjust their pace accordingly to allow collection of sub-samples.

Sampling techniques and equipment will vary slightly depending on the type of soil (cohesive, non-cohesive, cemented, oily, etc.) or solid waste to be collected. Additional information regarding this issue may be found in Appendix A, Section 7.1 of SW-846 Method 5035A.

In order to provide the laboratory with enough sample volume to account for potential re-analysis and to meet applicable quality assurance and quality control (QA/QC) requirements, it may be necessary to collect several (typically 3-5) sub-samples from each interval sampled within each sub-surface core. One additional sub-sample is also needed from each core to make a dry weight determination. Sampling personnel should plan accordingly prior to site mobilization to assure that sufficient equipment and containers are available at the time of sampling.

Based on field screening information, sampling personnel may determine that the sub-samples collected from a particular sub-surface core interval do not need to be sent to the laboratory for analysis and thus may be discarded. The time and equipment needed for collecting these discarded sub-samples should be factored into the overall cost for the sampling event. Strategic planning prior to site mobilization may limit the number of discarded sub-samples (and related costs) while still meeting project DQOs and requirements for representative sampling.

**Project-Specific Sampling Planning Guidance** – Method 5035A is generally recommended for all soil samples collected for VOC analysis for the purposes of delineation, verification, confirmation, or statistical analysis. However, traditional sampling methods may be acceptable for some specific projects as described below.

- Area Screening – When performing default or non-default Area Screening activities for VOCs (as described in the RISC Technical Guide [see reference below], Chapter 3.4.3.1) or an underground storage tank (UST) closure sampling assessment (under 329 IAC 9-6-2.5 and the RISC User's Guide [see reference below], Chapter 3), use

Method 5035A in most cases. If information collected is intended to obtain a "clean closure," use Method 5035A to ensure representative results. However, if additional investigations and/or corrective actions are intended, Method 5035A may not be needed for area screening.

- Site Characterization – When conducting investigations to determine the nature and extent of VOC soil contamination, use Method 5035A. If the investigation includes areas of known or suspected contamination, Method 5035A may not be needed as long as the variation in methods agrees with project DQOs. If the leaking underground storage tank (LUST) "Step-Out Procedure" is employed (as described in the RISC User's Guide, Chapter 3.5.1), use Method 5035A when soil samples collected are believed to be below RISC Residential Default Closure Levels for the contaminants of concern (COCs).

- Corrective Action – When conducting soil removal during a UST removal closure or soil excavation, use Method 5035A when the information will be used to verify that the source was removed or there was no release and/or source present (in the case of a UST closure). Collect soil from the excavation at locations prescribed by the IDEM program providing oversight. Generally, remove an additional six inches (6") of soil to expose soil that is representative of the actual conditions immediately before sampling using Method 5035A.

  Note: The above description does not apply to projects in the Resource Conservation and Recovery Act (RCRA) Corrective Action Program.

- Closure (No-further-action) – When collecting soil samples to confirm soil results meet closure standards, use Method 5035A for all samples sent to a stationary, off-site laboratory for analysis.

- Total Petroleum Hydrocarbons (TPH) – Thorough planning is needed to assure TPH sampling procedures will meet laboratory requirements and project DQOs. Soil samples to be analyzed for unknown petroleum products and gasoline range organics (GRO) should be collected and preserved using Method 5035A to minimize volatilization and biodegradation of the hydrocarbons. For analysis of many mid-range hydrocarbons (diesel range organics [DRO]) and high end hydrocarbons and oils (extended range organics [ERO]) in soil, traditional sample collection methods may be used. When TPH fractionation analysis is to be used to determine a site-specific closure level, use Method 5035A to collect and preserve all soil samples. Likewise, use Method 5035A to collect soil samples for analysis of VOC contaminants of concern. Additional information regarding this issue may be found in Chapter 8 of the RISC Technical Guide.

**Sensitive Receptors** – If the source is close to receptors or conduits, take special care to ensure representative results by using Method 5035A. Of particular concern are sources near drinking water wells, wellhead protection areas, or ecologically susceptible areas. In

these situations it is necessary to detect and define very low levels of contamination (typically on the periphery of a plume) prior to demonstrating site characterization.

**Sample Preservation and Holding Time** – Sample holding times ranging from 48 hours to 14 days are described in Method 5035A. Implementation of alternative procedures and/or chemical preservatives to extend the maximum holding time may be allowed in some cases, if it can be demonstrated that the concentrations of target analytes in the samples will not be significantly affected.

Common chemical preservatives such as methanol and sodium bisulfate may have effects (dilution or reaction with contaminants of concern, raised detection limits above set action levels, false positives and negatives, etc.) on the samples and thus may not be appropriate for some projects. Sample collection, preservation, and storage options should be selected based on the requirements of the DQOs for the project. Additional information regarding this issue may be found in Appendix A of SW-846 Method 5035A.

**Additional References**

"Standard Guide for Sampling Waste and Soils for Volatile Organic Compounds," ASTM Standard D 4547, current edition published February 2006, and updates.

"Standard Practice for Collection and Handling of Soils Obtained in Core Barrel Samplers for Environmental Investigations," ASTM Standard D 6640, current edition published May 2005, and updates.

"Risk Integrated System of Closure: Technical Resource Guidance Document," Indiana Department of Environmental Management, February 15, 2001, and updates. **[RISC Technical Guide]**

"Risk Integrated System of Closure: User's Guide," Indiana Department of Environmental Management, February 15, 2001, and updates. **[RISC User's Guide]**

Method 3815, "Screening Solid Samples for Volatile Organics" in *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, SW-846, Third Edition, Draft Update IVB; November 2000.